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BRIEF COMMUNICATION

# Successful Heart Transplant after Ten Hours Out-of-body Time using the TransMedics Organ Care System

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**Objective** We report the successful transplantation of a heart following an out-of-body time of 611 minutes into a recipient with dilated cardiomyopathy and left ventricular assist device implant.

**Patients** Our patient was urgently waiting for a cardiac transplant whilst receiving LVAD support. Recurrent VF and repeated AICD shocks necessitated this action.

**Results** Although requiring ECMO and inotropic support in the first 17 hours post-transplant, the patient was discharged from hospital on day 15 post-transplant with normal cardiac function.

**Conclusion** We report some of the salient points of the process and discuss the utility of this technology to an Australian transplant unit.

**Keywords** Transplantation • Heart transplantation • Organ preservation • ECMO • Heart failure • Cardiomyopathy

Cold organ preservation is the current standard of care for heart transplantation. After four hours, graft function may be compromised by extended ischaemic times, especially in older donors [1–4]. Warm ex-vivo organ perfusion, such as that provided by the TransMedics™Organ Care System (OCS), is being explored as an alternative method of preservation, to improve graft function, expand the donor pool and negate time considerations in organ procurement. In Perth, Western Australia, we began using the OCS as a way of utilising donor organs that may otherwise have not been utilised due to the geographical isolation of the city leading to prohibitively long ischaemic time. We report the case of the longest reported cross clamp to cross clamp time for a successful cardiac transplant.

The TransMedics™Organ Care System is a method of warm organ preservation where organs are placed on a rig and perfused with warm, oxygenated donor blood, delivered directly to the aortic root. The heart is drained via intracardiac vent back to reservoir. The heart will beat on the rig, although not under load. Two infusions are run into the blood reservoir to enable preservation of cardiac function, one containing predominantly adenosine in a maintenance

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solution and the other adrenaline. The adenosine-containing-solution is used as a coronary vasodilator and the adrenaline solution as a vasoconstrictor and chronotrope. The system monitors parameters including aortic pressure and coronary flow, with infusions and pump flows adjusted to maintain these parameters within a range as advised by TransMedics™. Arterial and venous blood gases are taken at regular intervals, with a focus on lactate. A lactate below 5mmol/L is deemed favourable for transplantation. Epicardial pacing leads allow the heart to be paced and defibrillation pads are incorporated in the system for defibrillation, if required. [Image 1: The TransMedics™ Organ Care System (OCS) – image courtesy of TransMedics™ Inc.]

Our recipient was a 39 year-old, 179 cm and 88 kg man with post-viral dilated cardiomyopathy. He had New York Heart Association class IV symptoms and underwent implantation of a Heartware® Left Ventricular Assist Device. Clinical status necessitated an urgent listing for transplant. A suitable donor heart became available. Donor cardiac function was excellent. Flight time on a return journey approximated a four to six hour flight, allowing for weather conditions. The donor offer would not normally have been accepted due to long ischaemic times but on this occasion it was accepted to use the OCS.

The donor procurement took place as per conventional and company protocols for the OCS. Total instrumentation time was 43 minutes until the heart was perfused in the rig. Time on the OCS was 503 minutes and implant time was 62 minutes. This resulted in a total cross clamp to cross clamp time of 611 minutes. We observed a number of unexpected biochemical parameters during the run, including a static lactate in the last two hours of the run and new onset hypernatraemia of 160mmol/L and hyperglycaemia with glucose over 11.5mmol/L. The significance of these was unclear at the time and mechanisms remain unclear. All perfusion parameters (coronary flow and aortic pressure) were maintained within the dictated parameters.


**Image 1** The Transmedics Organ Care System (OCS) – image courtesy of Transmedics Inc.

On arrival back at the transplant centre, there was a visual deterioration in function of the left ventricle on the OCS. The heart was noted to be oedematous. There was no useful cardiac activity despite a total cardiopulmonary bypass time of 340 minutes with 229 minutes of warm reperfusion, thus ECMO was commenced. ECMO was weaned off and the patient decannulated 17 hours and 31 minutes later. The intra-aortic balloon pump was removed after 66 hours. The recipient was extubated 72 hours after the transplant, discharged from hospital day 15 after the transplant with normal biventricular function. The recipient is over one year post-transplant with no episodes of rejection and has returned to work as a farmer.

As with any new technology, we expect a learning curve. Despite optimal perfusion parameters and lactate levels, there was primary graft dysfunction. The findings of a high sodium and glucose are interesting in the setting of myocardial oedema and may need to be addressed on other long runs.

This appears to be the longest reported out-of-body time for a successful cardiac transplant. Although the patient required large amounts of support in the first three days post transplant, he progressed extremely well and has completely normal graft function. This heart would not have otherwise been used without the availability of the OCS. The ability to push out ischaemic times beyond previous boundaries heralds an exciting time in solid organ transplantation with the hope that new technology such as this will allow us to use organs that would not normally be used for considerations of marginal function, time or distance.

## Author Agreement

The authors hereby declare, that this article is not currently under consideration for publication in another journal. All authors are in agreement as to the content of the article.

There are no conflicts of interest to report.

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